The Economics of Sovereignty: Phased Virtual Currency and Coalition Reserve Entity

Ravin Kumar[0000−0002−3416−2679]

Department of Computer Science, Meerut Institute of Engineering and Technology, Meerut-250005, Uttar Pradesh, India
ravin.kumar.cs.2013@miet.ac.in

Abstract. This paper proposes a phased virtual currency (VC) framework that enables coalitions of nations to reduce dependence on a target reserve currency while preserving macroeconomic stability and long-run monetary sovereignty. A jointly governed Coalition Reserve Entity (CRE) accepts deposits of the target currency, issues a blockchain-based asset-backed VC, and phases out reserves through a multi-step exponential decay schedule whose parameters are set collectively via on-chain governance and informed by policy signals such as VC velocity. The framework supports multi-currency settlement excluding the target currency using atomic on-chain FX conversion at CRE oracle rates, while a redemption firewall prevents leakage back to the phased-out currency. Stability is reinforced through diversified reserve management, volatility-sensitive buffer reserves, and optional stake-transfer auctions, with a lightweight coalition marketplace available as an optional coordination layer. Once the phaseout is complete, VC is redeemed for CRE-managed assets, the VC supply is extinguished, and the CRE itself dissolves, preventing the emergence of a permanent supranational currency or authority. A stylized BRICS case study illustrates how these mechanisms collectively enable orderly reserve diversification, resilient settlement flows, and stable coalition markets.

Keywords: Phased Virtual Currency · Economic Sovereignty · Coalition Reserve Entity · Blockchain · Asset Diversification · Multi-Currency Settlement · Phased Offloading

1 Introduction

The global financial system is highly dependent on a handful of dominant currencies that underpin trade settlements, sovereign reserves, and commodity pricing. According to the Federal Reserve, as of 2025, nearly 58% of global foreign exchange reserves are held in a single dominant reserve currency (e.g., USD for illustration), compared to 72% in 2001 [1, 8]. This heavy concentration creates systemic risks:

– Trade imbalances arising from over-reliance on a single settlement currency.

- Vulnerability to sanctions and policy changes imposed by reserve-currency issuers, reflecting the structural "exorbitant privilege" of the U.S. dollar [10], as illustrated by the 2022 freezing of Russian FX reserves.
- Volatility in exchange rates impacting cross-border trade competitiveness.
- Reduced sovereignty in monetary policy for smaller economies due to spillover effects from the dominant-currency issuer's monetary actions, such as U.S. quantitative tightening, which transmits globally through higher yields, capital outflows, and tighter financial conditions [11].
- Exposure to global liquidity surges from the dominant-currency issuer's quantitative easing, which transmits globally through destabilizing capital inflows, asset price inflation, and exchange-rate pressures in emerging markets [14].

Rather than a single-currency dominance, evidence points to a gradual shift toward a multiple-reserve-currency system with regional anchors [12], while practical cross-border CBDC arrangements remain emergent and require further coordination on design and interoperability [18].

This paper proposes a cooperative framework termed the Virtual Currency Coalition (VCC), designed to enable a phased transition away from reliance on a target reserve currency while safeguarding stability within coalition markets. At its core, the framework introduces a blockchain-based Phased Virtual Currency (VC) issued by a jointly governed Coalition Reserve Entity (CRE). In addition, it supports multi-currency settlement flexibility, ensuring that the target reserve currency is excluded from coalition transactions.

Throughout this paper, we use the U.S. dollar (USD) as an illustrative case of a target reserve currency. A target reserve currency is defined as the currency that the coalition collectively chooses to phase out in its reserves. The USD is chosen here solely for its empirical prominence in global reserves and not as a critique of, nor targeting of, any specific country. The framework itself is currency-agnostic and applies equally to any target reserve currency chosen by the coalition.

2 Framework Overview

The framework introduces a Coalition Reserve Entity (CRE), governed jointly by coalition members. Member nations deposit the target reserve currency, i.e., the currency (such as the USD) that the coalition has collectively decided to phase out, into the CRE, as shown in Figure 1. In exchange, the CRE issues a blockchain-based Virtual Currency (VC) at a fixed peg, typically:

$$1 \text{ VC} = 1 \text{ unit of target reserve currency.} \tag{1}$$

This helps maintain price stability and continuity in trade settlements within the coalition while the CRE gradually phases out deposited reserves from circulation.

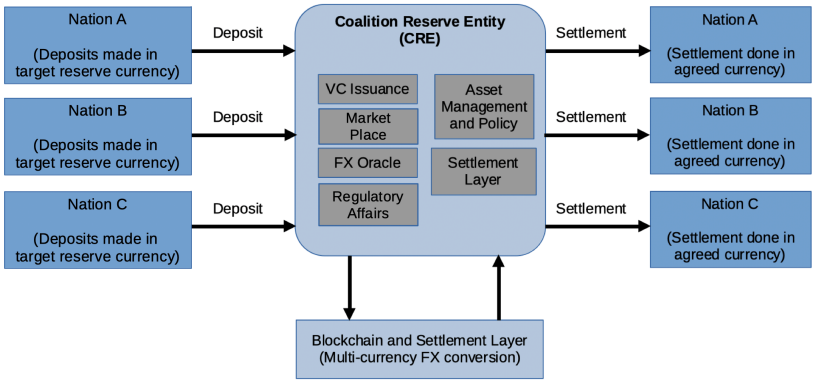

Fig. 1. System Architecture of the Coalition Reserve Entity Framework.

As illustrated in Figure 1, the CRE comprises functional modules that span both financial and governance roles: Virtual Currency (VC) issuance; asset management and policy (portfolio optimization, diversification, and buffer reserves); a settlement layer (multi-currency rules and on-chain FX conversion); regulatory affairs (governance, compliance, and treaty enforcement); and a coalition marketplace (to support intra-coalition trade and coordination). Each of these is elaborated in later sections.

2.1 Key Components

- **Deposits:** Member nations deposit reserves into the CRE in the currency they seek to reduce or phase out (i.e., target reserve currency).
- **VC Issuance:** The CRE allocates Virtual Currency (VC) proportionally to member deposits.
- **Phased Offloading:** The CRE gradually phases out holdings of the target reserve currency.
- **Asset Diversification:** The CRE reinvests proceeds into stable and diversifying assets.
- **Asset Redistribution:** Upon completion, members redeem their VC for coalition-held assets.

2.2 Coalition Reserve Entity Structure

The CRE is established as a new international financial institution through a multilateral treaty among participating nations. It operates with legal personality and immunity comparable to other international financial institutions. Its governance structure ensures balanced representation while protecting the interests of all member states.

2.3 Blockchain Implementation

The VC operates on a permissioned blockchain [9, 23] where nodes are operated by member central banks and financial authorities, reflecting the institutional design and governance emphasized in the CBDC literature [2, 18, 19]. This architecture provides:

- Immutable record of deposits, VC issuance, and transactions.
- Transparent auditing of asset backing and diversification activities.
- Smart contract automation for VC redemption, stake transfers, and FX conversions [9, 16].
- Settlement finality for inter-member transactions.

2.4 Multi-Currency Settlement Rules

To maximize flexibility and usability, the coalition supports payments in multiple settlement options for auctions, stake transfers, and trade:

1. **Default options:** The payer and seller may jointly choose to settle in (i) the payer's local currency or (ii) the seller's local currency.
2. **Mutually agreed settlement:** Both parties may agree to settle in any *coalition-approved currency*, provided it is not the target reserve currency currently being phased out.
3. **Seller's proceeds:** Regardless of the settlement choice, the seller shall receive funds in the seller's own currency, in any other mutually agreed upon currency, or in a combination thereof. On-chain atomic FX conversion is executed at CRE oracle rates, drawing on AMM-based models for cross-border CBDC exchange and fair FX rate formation [15, 20].
4. **FX transparency:** A bounded FX spread ε may be applied to support buffer reserves and operational costs.

Let q be the quantity, p_k the unit price in payer currency k, and $E_{k\to s}(t)$ the FX rate from payer k to seller s at time t:

$$\text{Debit (payer, in } k) = q \cdot p_k, \qquad \text{Credit (seller, in } s) = q \cdot p_k \cdot E_{k\to s}(t). \tag{2}$$

3 Mathematical Modeling

In this section, we formalize the mechanics of the proposed framework using mathematical models. Each formula captures one aspect of the coalition-driven virtual currency (VC) ecosystem, ensuring stability, transparency, and resilience during the transition away from target currencies.

3.1 VC Issuance Formula

$$VC_i = \frac{D_i}{\sum_{j=1}^{n} D_j} \cdot M_{vc} \tag{3}$$

where:

$D_i \leftarrow$ Deposit amount contributed by member nation i in the target reserve currency.
$n \leftarrow$ Total number of coalition members.
$M_{vc} \leftarrow$ Total supply of Virtual Currency issued by the Coalition Reserve Entity (CRE).
$VC_i \leftarrow$ Virtual Currency allocated to member i.

The formula mentioned in Equation 3 ensures that each member nation receives VC proportional to their contribution. For example, if one member contributes 20% of the total deposits, they are entitled to 20% of the issued VC.

3.2 Target Reserve Currency Offloading

Basic Target Reserve Currency Offloading: A basic target reserve currency offloading (i.e., phase out) program can be modeled as an exponential decay process as shown in Equation 4 with initial condition $C(0) = C_0$, hence $C_{\%}(0) = 100$ (units: $C_{\%}$ is in percentage points).

$$C_{\%}(t) = \frac{C(t)}{C_0} \times 100 = e^{-\lambda t} \times 100 \tag{4}$$

where:

$C_0 \leftarrow$ Total initial stock of the target reserve currency at the start of the program.
$C(t) \leftarrow$ The remaining stock of the target reserve currency at time t.
$C_{\%}(t) \leftarrow C(t)$ expressed in percentage terms.
$\lambda \leftarrow$ Constant decay rate controlling the speed of offloading and $\lambda \geq 0$.
$t \leftarrow$ Time (in years, quarters, or other policy-defined intervals).

By normalizing $C(t)$ with respect to the initial reserve C_0, the offloading path is expressed in percentage terms (from 100% down to 0%). This makes interpretation straightforward: at any time t, $C_{\%}(t)$ directly shows the proportion of the target reserve currency still held by the CRE.

However, in practice, the market conditions and coalition objectives rarely allow a constant λ, as assumed in Equation 4. Instead, a multi-step exponential decay can be implemented, where the decay rate changes across predefined phases.

Phased Target Reserve Currency Offloading: In this approach multi-step exponential decay is implemented by allowing different values of λ in each phase. The horizon $[0, T]$ is partitioned into N phases, $0 = t_0 < t_1 < \cdots < t_N = T$, with the decay constant λ_j applied in phase j. The generalized offloading path is expressed in Equation 5.

$$C_{\%}(t) = e^{-\sum_{i=1}^{j-1} \lambda_i (t_i - t_{i-1}) - \lambda_j (t - t_{j-1})} \times 100, \quad t \in [t_{j-1}, t_j) \tag{5}$$

Here, the summation term accounts for the cumulative decay in all completed phases, while the final term applies the current phase's decay λ_j from its start time t_{j-1}, where $\lambda_j \geq 0$.

Equivalently, within a single phase j, the offloading dynamics can be expressed locally as shown in Equation 6. (Units: $C_{\%}$ is in percentage points.). *Here, $C_{\%}(t_{j-1})$ represents the carry-over percentage from the end of the previous phase.*

$$C_{\%}(t) = e^{-\lambda_j (t - t_{j-1})} \times C_{\%}(t_{j-1}), \quad t \in [t_{j-1}, t_j) \tag{6}$$

Continuity: By construction, $\forall j \in \{1, 2, 3, \ldots, N-1\}$, $C_{\%}(t_j^-) = C_{\%}(t_j^+)$, so $C_{\%}(t)$ is continuous on $[0, T]$.

Equation 5 reduces to the simple exponential decay in Equation 4 when $N = 1$. The piecewise structure ensures continuity across phases and allows the coalition to adjust its pace. As shown in Figure 2, the coalition may begin with conservative offloading to minimize disruption, then accelerate once stability is established—balancing sovereignty goals against market risks [10,13,21,24]. The number of phases is flexible (not restricted to three) and may be adapted dynamically depending on coalition governance and external macroeconomic conditions.

For illustration, a coalition might adopt a three-phase decay schedule with representative decay parameters such as $\lambda_1 = 0.15$, $\lambda_2 = 0.35$, and $\lambda_3 = 0.25$. These values capture a conservative initial phase, a more aggressive mid-program acceleration, and a moderated tapering phase toward the end of the horizon.

An example of phased currency offloading is shown in Figure 2, where the coalition follows a three-phase schedule with decay parameters $\lambda_1 = 0.15$, $\lambda_2 = 0.35$, and $\lambda_3 = 0.25$. These values generate the illustrative offloading path used throughout the BRICS case study, but the framework does not require exactly three phases; depending on market conditions and coalition goals, it can employ fewer or more phases with varying λ values to achieve the desired transition path.

Governance on the value of λ: The value of λ is collectively determined through a blockchain-based [9,23] voting mechanism, ensuring transparency and equal participation of all coalition members. In cases where certain members disagree with the updated policy, they are provided with an option to trade their VC holdings within the coalition or participate in coalition-organized auctions. For auctions, the CRE regularly updates and communicates a minimum reference price, ensuring fair value protection for all members and preventing destabilizing speculative behavior.

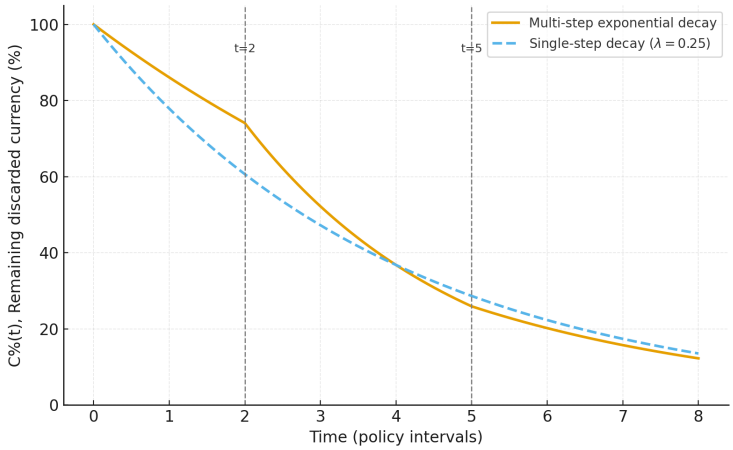

Fig. 2. Phased target reserve currency offloading using single-step vs. multi-step exponential decay. The multi-step path corresponds to representative decay parameters $\lambda_1 = 0.15$, $\lambda_2 = 0.35$, and $\lambda_3 = 0.25$.

In principle, the decay constant λ may be tuned dynamically as a policy instrument, informed by coalition governance and economic indicators such as VC circulation velocity, volatility of target reserve currency, and portfolio return targets.

3.3 Velocity of Virtual Currency

The coalition's virtual currency circulation can be analyzed using the classical *Equation of Exchange*, introduced by Irving Fisher [13].

$$M \cdot V = P \cdot T$$

where M denotes the money supply, V the velocity of circulation, P the average price level, and T the volume of transactions. Rearranging, velocity can be expressed as:

$$V = \frac{P \cdot T}{M}$$

In the coalition context, we adapt this to the virtual currency supply as shown in Equation 7. Here, V denotes velocity (not to be confused with VC, which refers to Virtual Currency throughout this paper).

$$V = \frac{P \cdot T}{M_{vc}} \tag{7}$$

where:

$V \leftarrow$ Velocity of circulation of the coalition's Virtual Currency.

$P \leftarrow$ Average price level of goods and services traded within the coalition.
$T \leftarrow$ Volume of transactions settled in the coalition.
$M_{vc} \leftarrow$ Total issued Virtual Currency.

The formulation presented in Equation 7 mirrors Fisher's monetary identity but substitutes the coalition's virtual currency for the traditional money supply. A higher V indicates strong adoption and trust, while a lower V may signal hoarding or underutilization. The VC is not intended as a permanent fixture but rather as a transitional instrument to absorb target reserves and enable their safe phaseout. At the end of the program, coalition members redeem VC for diversified assets managed by the CRE.

Velocity as a Policy Signal: Unlike Fisher's original use of velocity as a descriptive statistic, the coalition framework leverages V as a dynamic policy indicator:

1. If V is high, members are circulating VC rapidly, suggesting a stronger need to **accelerate the phaseout of the target reserve currency** so redemption into assets can occur sooner.
2. If V is low, the coalition may adopt a more conservative decay constant λ, slowing the offloading to avoid unnecessary shocks.

In this way, V becomes not only a measure of circulation but also a governance tool, guiding the coalition in adjusting λ and balancing the pace of target reserve currency disposal with both economic activity and collective risk appetite.

3.4 Asset Optimization Model

$$\min_{\mathbf{w}} \ \mathbf{w}^\top \mathbf{\Sigma} \mathbf{w} \quad \text{s.t. } \mathbf{w}^\top \mu \geq R_{\text{target}},\ \mathbf{w}^\top \mathbf{u} = 1,\ w_i \geq 0 \tag{8}$$

where:

$\mathbf{w} \leftarrow$ Vector of asset weights in the CRE's investment portfolio.
$\mathbf{\Sigma} \leftarrow$ Covariance matrix of asset returns (captures risk).
$\mu \leftarrow$ Expected return vector for assets.
$R_{\mathbf{target}} \leftarrow$ Minimum required return for the portfolio.
$\mathbf{u} \leftarrow$ Unity vector (all entries equal to 1), ensuring portfolio weights sum to 1.
$w_i \leftarrow$ Weight assigned to asset i (must be non-negative).

The formulation in Equation 8 corresponds to the Markowitz model of Modern Portfolio Theory (MPT), where the objective is to minimize portfolio variance subject to return, budget, and non-negativity constraints [21, 22]. This serves as the default asset optimization framework for the CRE.

This mean-variance optimization problem minimizes portfolio risk while ensuring returns exceed a defined threshold [17, 21, 22]. The covariance matrix $\mathbf{\Sigma}$ captures the interaction of risks across assets, while the expected return vector

μ ensures the coalition's portfolio remains yield-generating. The unity vector $\mathbf{u}$ enforces the normalization constraint, requiring all weights to sum to one. This diversification preserves long-term value and resilience of coalition reserves.

It is important to note that the formulation presented in Equation 8 is one of the possible examples of asset optimization. The CRE, at its initial stage, can select any suitable optimization framework — such as robust optimization [4], Black–Litterman allocation [7], Conditional Value-at-Risk (CVaR) minimization [24], or scenario-based stochastic programming [5, 6], present it to coalition members, and after collective agreement implement it as the official reserve diversification policy.

3.5 Buffer Reserve Mechanism

$$B = \max\Big(\alpha \cdot M_{vc},\ \sigma_C \cdot \sqrt{t}\Big) \tag{9}$$

where:

$B \leftarrow$ Required buffer reserves.
$M_{vc} \leftarrow$ Total issued Virtual Currency.
$\sigma_C \leftarrow$ Standard deviation of fluctuations in target reserve currency's value.
$t \leftarrow$ Time horizon for reserve adequacy assessment.
$\alpha \leftarrow$ Fixed safeguard fraction (commonly set to 0.05, i.e., 5%).

Note: Since each VC is initially pegged one-to-one with the target reserve currency, the buffer reserve B is denominated in the target reserve currency during the transition phase. After the phaseout, B is maintained in coalition-approved assets and expressed in equivalent coalition currency terms as well as in VC.

The buffer reserve expressed in Equation 9 safeguards the coalition against volatility and operational shocks. It is defined as the greater of: 1) a fixed safeguard $\alpha \cdot M_{vc}$, where α is typically set to 0.05 (5%), and 2) a volatility-based requirement that increases with time as $\sigma_C \cdot \sqrt{t}$.

This dual rule ensures both predictability (via the fixed safeguard) and adaptability (via the volatility-based term). The design draws conceptual inspiration from the Liquidity Coverage Ratio (LCR) under Basel III, which requires banks to hold high-quality liquid assets sufficient to withstand a 30-day stress scenario [3]. By analogy, the coalition's buffer reserve ensures that CRE-managed assets remain resilient under varying market conditions while retaining a clear prudential anchor.

3.6 Settlement Equation

$$\text{Debit (payer, in } k) = q \cdot p_k, \qquad \text{Credit (seller, in } s) = q \cdot p_k \cdot E_{k \to s}(t) \tag{10}$$

where:

$q \leftarrow$ Quantity of goods or services traded.
$p_k \leftarrow$ Unit price in payer's currency k.

$E_{k\to s}(t) \leftarrow$ FX rate from payer's currency k to seller's currency s, as determined by CRE oracles at time t.
Debit $\leftarrow$ Amount deducted from payer in their local currency.
Credit $\leftarrow$ Amount credited to seller in their local currency.

The settlement rule shown in Equation 10 guarantees that sellers always receive proceeds in their desired currency. On-chain atomic FX conversions at CRE oracle rates ensure fairness, transparency, and protection against manipulation.

3.7 Terminal Redemption (After Phaseout)

When the target reserve currency is fully phased out (say at time τ with $C(\tau) = 0$) by the CRE, the Virtual Currency (VC) is no longer backed by the old reserves but instead by the diversified assets the CRE has accumulated. The value of one VC at time t is expressed in Equation 11 as $v(t)$.

$$v(t) = \frac{A(t)}{M_{vc}^{\text{out}}(t)} \tag{11}$$

where:

$A(t) \leftarrow$ total market value of CRE's assets at time t.
$M_{vc}^{\mathbf{out}}(t) \leftarrow$ number of VC still in circulation at time t.

In Equation 11, $M_{vc}^{\text{out}}(t)$ is the outstanding VC supply at time t.

Redemption after phaseout: At $t \geq \tau$, each unit of VC can be redeemed in two ways:

1. **In assets:** receive a proportional share of the CRE's asset portfolio, i.e., $\frac{1}{M_{vc}^{\text{out}}(t)}$ of each asset.
2. **In currency:** receive $v(t)$ converted into any coalition-approved currency, using the oracle FX rate $E_{k\to s}(t)$ (minus a small spread ε for reserves) at time t.

If values drift:

If $v(\tau) > 1$, members gain extra value per VC.
If $v(\tau) < 1$, members take a uniform haircut equal to the shortfall.

In both cases, the buffer reserve (Eq. 9) is used first to reduce risk.

3.8 Long-Run Role of the Virtual Currency and the CRE

In the proposed framework, the Virtual Currency (VC) is designed explicitly as a *transitional* instrument rather than a permanent monetary unit. Once the target reserve currency has been fully phased out and the terminal redemption process (Eq. 11) is complete, the VC is dissolved.

Formally, after all outstanding VC units have either been redeemed into coalition-approved assets or extinguished via conversion into fiat currencies, the total outstanding supply $M_{vc}^{\text{out}}(t)$ is driven to zero. At this point, the VC ceases to function in any monetary capacity, and no further issuance is permitted under the coalition treaty.

This design choice prevents the transitional VC from evolving into a de facto supranational reserve currency and ensures that long-run monetary sovereignty remains anchored in member-issued national currencies.

Dissolution of the CRE: Because the Coalition Reserve Entity (CRE) is created solely to absorb, diversify, and redistribute the target reserve currency, its institutional mandate concludes once all VC has been redeemed and all diversified assets have been allocated back to member states. After completing these functions, the CRE is dissolved. This prevents the emergence of a permanent supranational financial authority and ensures that the coalition framework does not outlive its specific transitional purpose. Long-run sovereignty therefore remains fully with the member nations rather than with a continuing centralized institution.

4 Case Study Simulation

To illustrate the proposed framework, consider a coalition of five member nations: Brazil, Russia, India, China, and South Africa (BRICS). Each deposits a portion of their USD reserves into the Coalition Reserve Entity (CRE), receiving proportional allocations of Virtual Currency (VC). The initial deposits are: Brazil ($10B), Russia ($8B), India ($6B), China ($12B), and South Africa ($4B). The CRE issues VC pegged one-to-one to these deposits, ensuring stability at inception. The case is hypothetical and only illustrative.
Neutrality note: USD is used here solely as a representative example of a target reserve currency; the framework is currency-agnostic.

4.1 Baseline Phaseout and Settlement

During the first two years, the coalition adopts a conservative phaseout strategy with decay constant $\lambda_1 = 0.15$. This baseline phase corresponds to the initial segment of the multi-step decay path shown in Figure 2. This ensures gradual offloading of USD reserves without disrupting coalition markets. Multi-currency settlement allows trade between India and Brazil, for example, to be settled in either INR or BRL, with the seller always receiving proceeds in their preferred currency via on-chain FX conversion. This flexibility encourages early adoption of VC while preserving fairness.

4.2 Policy Adjustment via Governance

By the beginning of year 3, the measured velocity (V) of VC rises sharply, signaling strong circulation within the coalition. Based on this, China proposes

accelerating the phaseout by updating the decay parameter to $\lambda_2 = 0.35$ for the next phase, with a subsequent tapering phase at $\lambda_3 = 0.25$ toward the end of the program. The proposal is submitted on the blockchain and voted upon by all members. Russia, India, and China vote in favor of the faster phaseout, while Brazil and South Africa oppose, citing domestic concerns about financial stability.

4.3 Exit Mechanism for Dissenting Members

In line with coalition governance, Brazil and South Africa exercise their right to partially exit by auctioning a share of their VC holdings. The auction is conducted within the coalition, with bids denominated in coalition-approved currencies. To protect value, the CRE provides and regularly updates a minimum reference price for these auctions. India and China absorb most of the auctioned VC, thereby increasing their stake in the coalition's reserves.

4.4 Asset Diversification and Buffer Management

As USD reserves are phased out, the CRE diversifies proceeds into a portfolio of government bonds, gold, and strategic commodities using the mean–variance optimization model. To ensure stability, buffer reserves are maintained according to Equation 9 with $\alpha = 0.05$ (5%). That is,

$$B = \max\Big(0.05\, M_{vc},\ \sigma_C \sqrt{t}\Big)$$

This dual safeguard protects against both market volatility and systemic risks, ensuring the coalition remains resilient. Here, t denotes the reserve adequacy horizon (e.g., years).

4.5 Outcome

By the beginning of year 5, the coalition has reduced its USD exposure by more than 60%, demonstrating the effectiveness of phased exponential decay with adaptive governance [12]. Trade continues seamlessly under multi-currency settlement rules, dissenting members are accommodated through transparent auctions, and diversified asset redistribution preserves long-term value. The case highlights how programmable governance, velocity-driven policy signals, and buffer mechanisms can collectively provide a credible pathway toward monetary sovereignty and financial resilience for coalition members.

5 Coalition Trade Discipline and Marketplace Development

The effectiveness of the Coalition Reserve Entity (CRE) and Virtual Currency (VC) framework depends not only on reserve diversification but also on the trade

practices of coalition members. To support the phased reduction of the target reserve currency, member nations are encouraged to adopt trade practices that naturally align commercial flows with coalition monetary objectives.

5.1 Intra-Coalition Trade

Members may find it advantageous to conduct a larger share of their intra-coalition imports and exports in coalition-approved currencies. Doing so concentrates settlement activity within the coalition's currency space and naturally supports the functioning of the Virtual Currency (VC) framework. Reducing routine use of the target reserve currency in internal trade helps align reserve management with real-economy activity, but participation in this practice remains fully at the discretion of each member state.

5.2 External Trade with Non-Members

When trading with non-coalition partners, members may choose to reduce reliance on the target reserve currency where feasible, taking into account their own domestic priorities and bilateral agreements. Alternative settlement options include:

1. the coalition's blockchain-based Virtual Currency (VC), provided it remains fully backed and redeemable according to CRE rules (see Eq. 11 and Eq. 9),
2. any coalition-approved fiat currency, or
3. the non-member partner's local currency, if mutually agreed upon.

These options are intended to expand flexibility rather than impose restrictions, allowing members to select whichever arrangement best suits their commercial and diplomatic relationships.

Redemption firewall: To prevent leakage of value back to the target reserve currency issuer, redemption rights are restricted. Non-member entities that accept VC in settlement may only redeem it into coalition-approved fiat currencies or the local currency of a coalition member, but never into the phased-out target reserve currency itself. This rule ensures that the target country cannot indirectly benefit from coalition-issued VC, while still preserving flexibility for global trade partners.

This approach ensures that dependence on the target reserve currency is gradually reduced even in global trade flows, while preserving the flexibility of members to engage with non-coalition partners.

Operational Workflow for Non-Member Redemption: To operationalize the redemption firewall, the CRE implements a four-step workflow:

1. **Verification:** A non-member entity holding VC submits a redemption request to a CRE gateway node operated by a member central bank. The gateway validates the identity of the requesting institution using standard KYC/AML procedures.
2. **Firewall Enforcement:** The gateway executes an automated smart-contract check ensuring that the requested redemption currency belongs to the coalition-approved set and the non-member is not on the blacklist of the coalition. Any request attempting conversion into the phased-out target reserve currency is programmatically rejected.
3. **FX Conversion:** If approved, the VC is burned and the equivalent value is converted into the requested coalition-approved fiat currency (or the member's local currency) using oracle-supplied rates and the settlement rule in Eq. 10.
4. **Final Settlement:** Funds are delivered via on-chain settlement for blockchain-based CBDCs or via off-chain RTGS/settlement networks for conventional fiat currencies. The entire workflow is auditable on the permissioned ledger.

This workflow ensures that non-member participation does not allow indirect leakage back to the target currency issuer, while preserving settlement flexibility for global trade partners.

5.3 CRE-Supported Marketplace

To help reduce reliance on the target reserve currency in intra-coalition trade, the CRE may support a lightweight digital Coalition Marketplace that functions as an optional coordination layer rather than a mandatory trading platform. Its role is simply to make it easier for members to discover counterparties, identify surplus–deficit opportunities, and, when desired, settle transactions using coalition-approved currencies through the existing settlement mechanism (Eq. 10). Participation is entirely voluntary, and members remain free to trade bilaterally or through established commercial channels. By lowering informational and settlement frictions that often push traders toward the target reserve currency by default, the marketplace supports the coalition's broader monetary objectives while preserving full autonomy for each member's trade and procurement decisions.

5.4 Non-Member Accumulation Risk

The coalition explicitly mitigates the risk of non-member entities accumulating excessive VC and influencing coalition markets. First, the redemption firewall ensures that VC cannot be converted back into the phased-out target reserve currency, removing incentives for speculative accumulation. Second, non-members receive no governance rights, regardless of how much VC they hold. Third, the CRE monitors concentration metrics and may apply circuit-breakers that throttle large-scale non-member purchases during auctions or transfers. The CRE may also maintain a blacklist of entities (i.e., non-members) that leak coalition

resources toward the target reserve currency and restrict the accumulation, usage, and redemption of the VC by such entities. These safeguards ensure that external entities cannot indirectly shape coalition monetary policy or settlement dynamics.

5.5 Policy Complementarity

Together, these measures ensure that both the financial side (reserves) and the real-economy side (trade) reinforce one another. Reserve diversification without trade discipline risks reversal, while trade discipline without reserve backing risks instability. The CRE's dual role, managing reserves and enabling intra-coalition trade, provides a coherent pathway for reducing long-term dependence on the target reserve currency.

6 Stake Transfer Mechanism

The stake transfer mechanism enables coalition members to liquidate, rebalance, or reallocate their VC holdings in a transparent and orderly manner. This ensures that members who wish to adjust their exposure can do so without destabilizing coalition markets. The process operates as follows:

1. **Initiation:** A member nation (seller) notifies the CRE of its intention to transfer or auction part of its VC holdings.
2. **Approval and Offering:** The CRE verifies the request and facilitates an on-chain auction or direct transfer. All coalition members are eligible to participate as potential buyers, subject to coalition-approved rules.
3. **Pricing:** The CRE provides reference valuations for the VC based on prevailing asset backing and reserve composition. In case of an auction, the CRE regularly updates and communicates a minimum reference price to ensure value protection and discourage speculative underbidding.
4. **Settlement:** Payment can be made in the payer's local currency, the seller's local currency, or any other mutually agreed coalition-approved currency (excluding the phased-out currency). Regardless of the chosen option, the seller always receives proceeds in their desired currency (or a negotiated basket thereof) through atomic on-chain FX conversion at CRE oracle rates, ensuring fairness and transparency.

This mechanism balances flexibility for individual members with systemic stability. By embedding auctions, transparent pricing, and settlement guarantees into the blockchain, the coalition ensures that stake transfers remain orderly, inclusive, and resistant to manipulation.

7 Conclusion

This paper introduced a coalition-based framework in which a temporary Coalition Reserve Entity (CRE) issues an asset-backed Virtual Currency (VC) to

absorb and phase out a target reserve currency through a multi-step exponential decay process governed by collective voting. Supported by diversified asset management, volatility-aware buffer reserves, multi-currency settlement with on-chain FX conversion, optional auctions for stake adjustment, and trade-discipline measures, the framework enables coalitions to reduce dependence on a dominant currency while maintaining stable commercial and financial flows. The case study illustrates how phased decay, velocity-informed policy adjustment, and orderly member rebalancing allow for substantial reserve diversification without market disruption. Crucially, both the VC and the CRE are strictly transitional: once reserves are offloaded and all VC is redeemed or extinguished, the CRE dissolves, preventing the formation of any permanent supranational currency or authority and restoring long-run monetary sovereignty to member states.

Limitations & directions for future research: Issues such as capital controls, sanctions routing, and oracle governance attacks are not treated here. Empirical calibration of decay paths, stress testing of CRE auctions and buffer rules, and interoperability with cross-border CBDC arrangements remain important topics for future work.

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